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Sandstrom et al.

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(54) **BULK ENHANCED PAPERBOARD AND SHAPED PRODUCTS MADE THEREFROM**

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(57)

ABSTRACT

(21) Appl. No.: **09/314,767**

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Related U.S. Application Data

(63) Continuation-in-part of application No. 08/896,239, filed on Jul. 17, 1997, now abandoned, which is a continuation-in-part of application No. 08/716,511, filed on Sep. 20, 1996, now abandoned.

An improved paperboard has been bulk enhanced by retaining a substantial portion of bulk-enhanced additives including expandable microspheres in a suitable distribution within the paperboard. The cellulosic paperboard web has an overall fiber weight (w) of at least 40 lbs./3000 square feet and at a fiber density of 3, 4.5, 6.5, 7, 8.3, and 9 pounds per 3000 square foot ream at a fiberboard thickness of 0.001 inch respectively, has a GM Taber stiffness of at least about 0.00716 $w^{2.63}$ grams-centimeter/fiber mat density^{1.63} pounds per 3000 square foot ream at a fiberboard thickness of 0.001 inch, and a GM tensile stiffness of at least about 1890+24.2 w pounds per inch. The high retention of the bulk enhancing additives is believed to result from the incorporation of suitable retention aids. The resulting paperboard has better GM Taber stiffness values and GM tensile stiffness than prior art paperboards. The paperboard also has increased strain to failure and is able to be formed into suitable paperboard containers without loss of integrity. The resulting containers have increased hold times when they contain hot or cold food or drink.

(51) Int. Cl.⁷ **D21H 27/30**

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(58) Field of Search **162/123, 125, 162/127, 129, 130, 135, 137, 158**

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69 Claims, 41 Drawing Sheets